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PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Docket No: Q96217

Mitsuru YAMAMOTO, et al.

Appln. No.: 10/590,081

Group Art Unit: 2856

Confirmation No.: 4161

Examiner: Unknown

Filed: August 21, 2006

For: **DRIVE CIRCUIT FOR PIEZOELECTRIC PUMP AND COOLING SYSTEM THAT
USES THIS DRIVE CIRCUIT**

SUBMISSION OF INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

For the Examiner's convenience, enclosed herewith is a copy of the English translation of the International Preliminary Report on Patentability (IPRP). It is assumed that copies of the cited references as required by §371(c) will be supplied directly by the International Bureau, but if further copies are needed, the undersigned will undertake to provide them upon request.

Respectfully submitted,

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WASHINGTON OFFICE

23373

CUSTOMER NUMBER

Date: January 17, 2007

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF TRANSMITTAL
OF COPIES OF TRANSLATION
OF THE INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY
(CHAPTER I OR CHAPTER II
OF THE PATENT COOPERATION TREATY)
(PCT Rules 44bis.3(c) and 72.2)

To:

MIYAZAKI, Teruo
8th Floor, 16th Kowa Bldg., 9-20, Akasaka 1-chome
Minato-ku, Tokyo 1070052
JAPON

Date of mailing (day/month/year)
07 December 2006 (07.12.2006)

Applicant's or agent's file reference
NEC04P229

IMPORTANT NOTIFICATION

International application No.
PCT/JP2005/001389

International filing date (day/month/year)
01 February 2005 (01.02.2005)

Applicant

NEC CORPORATION et al

1. Transmittal of the translation to the applicant.



The International Bureau transmits herewith a copy of the English translation of the international preliminary report on patentability (Chapter I).



The International Bureau transmits herewith a copy of the English translation of the international preliminary report on patentability (Chapter II).

2. Transmittal of the copy of the translation to the designated or elected Offices.

The International Bureau notifies the applicant that copies of that translation have been transmitted to the following designated or elected Offices requiring such translation:

EP, KR

The following designated or elected Offices, having waived the requirement for such a transmittal at this time, will receive copies of that translation from the International Bureau only upon their request:

AE, AG, AL, AM, AP, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EA, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OA, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW

3. Reminder regarding translation into (one of) the official language(s) of the elected Office(s).

The applicant is reminded that, where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability (Chapter II).

It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned within the applicable time limit (Rule 74.1). See Volume II of the PCT Applicant's Guide for further details.

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TRANSLATION

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference NEC04P229	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. PCT/JP2005/001389	International filing date (day/month/year) 01.02.2005	Priority date (day/month/year) 23.02.2004
International Patent Classification (IPC) or national classification and IPC F04B9/00 (2006.01), H01L23/473 (2006.01)		
Applicant NEC CORPORATION		

<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>17</u> sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> (sent to the applicant and to the International Bureau) a total of <u>7</u> sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>																									
<p>4. This report contains indications relating to the following items:</p> <table><tr><td><input checked="" type="checkbox"/></td><td>Box No. I</td><td>Basis of the report</td></tr><tr><td><input type="checkbox"/></td><td>Box No. II</td><td>Priority</td></tr><tr><td><input type="checkbox"/></td><td>Box No. III</td><td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td></tr><tr><td><input type="checkbox"/></td><td>Box No. IV</td><td>Lack of unity of invention</td></tr><tr><td><input checked="" type="checkbox"/></td><td>Box No. V</td><td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td></tr><tr><td><input type="checkbox"/></td><td>Box No. VI</td><td>Certain documents cited</td></tr><tr><td><input type="checkbox"/></td><td>Box No. VII</td><td>Certain defects in the international application</td></tr><tr><td><input checked="" type="checkbox"/></td><td>Box No. VIII</td><td>Certain observations on the international application</td></tr></table>		<input checked="" type="checkbox"/>	Box No. I	Basis of the report	<input type="checkbox"/>	Box No. II	Priority	<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	<input type="checkbox"/>	Box No. IV	Lack of unity of invention	<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	<input type="checkbox"/>	Box No. VI	Certain documents cited	<input type="checkbox"/>	Box No. VII	Certain defects in the international application	<input checked="" type="checkbox"/>	Box No. VIII	Certain observations on the international application
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<input checked="" type="checkbox"/>	Box No. VIII	Certain observations on the international application																							
Date of submission of the demand	Date of completion of this report																								
Name and mailing address of the IPEA/JP	Authorized officer																								
Facsimile No.	Telephone No.																								

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Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following _____ which is the language of a translation furnished for the purposes of:
- ☐ international search (Rule 12.3 and 23.1(b))
- ☐ publication of the international application (Rule 12.4)
- ☐ international preliminary examination (Rule 55.2 and/or 55.3)
2. With regard to the elements of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):
- ☐ the international application as originally filed/furnished
- ☒ the description:
- pages 1-11 _____ as originally filed/furnished
- pages* _____ received by this Authority on _____
- pages* _____ received by this Authority on _____
- ☒ the claims:
- nos. _____ as originally filed/furnished
- nos.* _____ as amended (together with any statement) under Article 19
- nos.* 1-14 received by this Authority on 13.07.2005
- nos.* _____ received by this Authority on _____
- ☒ the drawings:
- sheets 1-9 _____ as originally filed/furnished
- sheets* _____ received by this Authority on _____
- sheets* _____ received by this Authority on _____
- ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages _____
- ☐ the claims, nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to sequence listing (*specify*): _____
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages _____
- ☐ the claims, nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

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Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
1. Statement	
Novelty (N)	Claims <u>1-14</u> YES Claims _____ NO
Inventive step (IS)	Claims <u>2, 9</u> YES Claims <u>1, 3-8, 10-14</u> NO
Industrial applicability (IA)	Claims <u>1-14</u> YES Claims _____ NO
2. Citations and explanations (Rule 70.7)	
	Document 1: Microfilm of the specification and drawings annexed to the Japanese Utility Model Application No. 189816/1987 (Laid-open No. 93379/1989) (Misuzu Eric Co., Ltd.), 20 June 1989
	Document 2: JP 4-183978 A (Seiko Epson Corporation), 30 June 1992
	Document 3: JP 2003-120541 A (Matsushita Electric Industrial Co., Ltd.), 23 April 2003
	Document 4: JP 2001-355574 A (Matsushita Electric Industrial Co., Ltd.), 26 December 2001
	Document 5: JP 9-324764 A (Matsushita Refrigeration Co.), 16 December 1997
	Document 6: JP 2003-29879 A (Hitachi, Ltd.), 31 January 2003
	Document 7: JP 2002-163042 A (Toshiba Corporation), 7 June 2002
	Document 8: JP 2003-121254 A (Yasuhiko Tawara), 23 April 2003
	<p>The invention set forth in claim 1 does not involve an inventive step in the light of documents 1 and 2 cited in the international search report and newly cited</p>

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citations and explanations supporting such statement

document 8.

In the light of document 1 (description, page 6, lines 6 to 10), the piezoelectric pump driving circuit set forth in document 1 is understood to have a sine wave transmitting means (8) and amplifying means (10, 11).

Although document 1 does not indicate that these amplifying means (10, 11) are driven by a high voltage generated by the voltage boosting means, in driving an amplifying means it is a known technique to drive a circuit with a high voltage generated by a voltage-boosting means which converts a low-voltage power supply into a high voltage, as set forth in document 2 (page 2, lower left column, line 7 to upper right column, line 1).

In addition, in amplifying a signal which drives a piezoelectric element, it is a known technique to use a Class D amplifier and low pass filter, as set forth in document 8 (paragraphs [0024] to [0026]) for example, therefore it would be easy for a person skilled in the art to constitute a signal amplifying means to use a Class D amplifier and a low pass filter.

The inventions set forth in claims 2 and 9 are not disclosed in any of the documents cited in the international search report, and are therefore novel and involve an inventive step. In particular, none of the documents discloses or suggests a controlling means which controls fluctuations in frequency when starting up a sine wave oscillating means using three or more different frequencies.

The invention set forth in claim 3 does not involve an inventive step in the light of documents 1 to 3 cited

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in the international search report and newly cited document 8.

In the light of document 1 (description, page 6, lines 6 to 10), the piezoelectric pump driving circuit is understood to have a sine wave generating means (8) and amplifying means (10, 11).

Although document 1 does not indicate that these amplifying means (10, 11) are driven by a high voltage generated by the voltage boosting means, in driving an amplifying means it is a known technique to drive a circuit with a high voltage generated by a voltage-boosting means which converts a low-voltage power supply into a high voltage, as set forth in document 2 (page 2, lower left column, line 7 to upper right column, line 1).

In addition, in amplifying a signal which drives a piezoelectric element, it is a known technique to use a Class D amplifier and low pass filter, as set forth in document 8 (paragraphs [0024] to [0026]) for example, therefore it would be easy for a person skilled in the art to constitute a signal amplifying means to use a Class D amplifier and a low pass filter.

In addition, discharging foam by controlling fluctuations in frequency is a known technique, as set forth in document 3 (paragraph [0031], for example), and the problem that foam exists at startup is a widely known technical matter in the technical field relating to liquid pumps, therefore it would be easy for a person skilled in the art to constitute an invention so as to vary the frequency when starting up a pump.

The invention set forth in claim 4 does not involve an inventive step in the light of documents 1, 2 and 4

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cited in the international search report.

In the light of document 1 (description, page 6, lines 6 to 10), the piezoelectric pump driving circuit is understood to have a sine wave generating means (8) and amplifying means (10, 11).

Although document 1 does not indicate that these amplifying means (10, 11) are driven by a high voltage generated by the voltage boosting means, in driving an amplifying means it is a known technique to drive a circuit with a high voltage generated by a voltage-boosting means which converts a low-voltage power supply into a high voltage, as set forth in document 2 (page 2, lower left column, line 7 to upper right column, line 1).

In addition, document 4 (paragraph [0031]) indicates that the driving voltage which drives a piezoelectric transducer is varied according to the temperature detected by a temperature sensor (26), therefore it would be easy for a person skilled in the art to provide a controlling means which adjusts the signal amplitude of a sine wave transmitting means according to the temperature detected by a temperature detecting means.

The invention set forth in claim 5 does not involve an inventive step in the light of documents 1, 2 and 4 cited in the international search report and newly cited document 8.

In the light of document 1 (description, page 6, lines 6 to 10), the piezoelectric pump driving circuit set forth in document 1 is understood to have a sine wave transmitting means (8) and amplifying means (10, 11).

Although document 1 does not indicate that these amplifying means (10, 11) are driven by a high voltage

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generated by the voltage boosting means, in driving an amplifying means it is a known technique to drive a circuit with a high voltage generated by a voltage-boosting means which converts a low-voltage power supply into a high voltage, as set forth in document 2 (page 2, lower left column, line 7 to upper right column, line 1).

In addition, in amplifying a signal which drives a piezoelectric element, it is a known technique to use a Class D amplifier and low pass filter, as set forth in document 8 (paragraphs [0024] to [0026]) for example, therefore it would be easy for a person skilled in the art to constitute a signal amplifying means to use a Class D amplifier and a low pass filter.

In addition, document 4 (paragraph [0031]) indicates that the driving voltage which drives a piezoelectric transducer is varied according to the temperature detected by a temperature sensor (26), therefore it would be easy for a person skilled in the art to provide a controlling means which adjusts the signal amplitude of a sine wave transmitting means according to the temperature detected by a temperature detecting means.

The invention set forth in claim 6 does not involve an inventive step in the light of documents 1 to 4 cited in the international search report.

In the light of document 1 (description, page 6, lines 6 to 10), the piezoelectric pump driving circuit set forth in document 1 is understood to have a sine wave transmitting means (8) and amplifying means (10, 11).

Although document 1 does not indicate that these amplifying means (10, 11) are driven by a high voltage generated by the voltage boosting means, in driving an

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amplifying means it is a known technique to drive a circuit with a high voltage generated by a voltage-boosting means which converts a low-voltage power supply into a high voltage, as set forth in document 2 (page 2, lower left column, line 7 to upper right column, line 1).

In addition, discharging foam by controlling fluctuations in frequency is a known technique, as set forth in document 3 (paragraph [0031], for example), and the problem that foam exists at startup is a widely known technical matter in the technical field relating to liquid pumps, therefore it would be easy for a person skilled in the art to constitute an invention so as to vary the frequency when starting up a pump.

In addition, document 4. (paragraph [0031]) indicates that the driving voltage which drives a piezoelectric transducer is varied according to the temperature detected by a temperature sensor (26), therefore it would be easy for a person skilled in the art to provide a controlling means which adjusts the signal amplitude of a sine wave transmitting means according to the temperature detected by a temperature detecting means.

The invention set forth in claim 7 does not involve an inventive step in the light of documents 1 to 4 cited in the international search report and newly cited document 8.

In the light of document 1 (description, page 6, lines 6 to 10), the piezoelectric pump driving circuit set forth in document 1 is understood to have a sine wave transmitting means (8) and amplifying means (10, 11).

Although document 1 does not indicate that these amplifying means (10, 11) are driven by a high voltage

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generated by the voltage boosting means, in driving an amplifying means it is a known technique to drive a circuit with a high voltage generated by a voltage-boosting means which converts a low-voltage power supply into a high voltage, as set forth in document 2 (page 2, lower left column, line 7 to upper right column, line 1).

In addition, in amplifying a signal which drives a piezoelectric element, it is a known technique to use a Class D amplifier and low pass filter, as set forth in document 8 (paragraphs [0024] to [0026]) for example, therefore it would be easy for a person skilled in the art to constitute a signal amplifying means to use a Class D amplifier and a low pass filter.

In addition, discharging foam by controlling fluctuations in frequency is a known technique, as set forth in document 3 (paragraph [0031], for example), and the problem that foam exists at startup is a widely known technical matter in the technical field relating to liquid pumps, therefore it would be easy for a person skilled in the art to constitute an invention so as to vary the frequency when starting up a pump.

In addition, document 4 (paragraph [0031]) indicates that the driving voltage which drives a piezoelectric transducer is varied according to the temperature detected by a temperature sensor (26), therefore it would be easy for a person skilled in the art to provide a controlling means which adjusts the signal amplitude of a sine wave transmitting means according to the temperature detected by a temperature detecting means.

The invention set forth in claim 8 does not involve an inventive step in the light of documents 1, 2 and 4

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cited in the international search report, and newly cited document 8.

In the light of document 1 (description, page 6, lines 6 to 10), the piezoelectric pump driving circuit set forth in document 1 is understood to have a sine wave transmitting means (8) and amplifying means (10, 11).

Although document 1 does not indicate that these amplifying means (10, 11) are driven by a high voltage generated by the voltage boosting means, in driving an amplifying means it is a known technique to drive a circuit with a high voltage generated by a voltage-boosting means which converts a low-voltage power supply into a high voltage, as set forth in document 2 (page 2, lower left column, line 7 to upper right column, line 1).

In addition, in amplifying a signal which drives a piezoelectric element, it is a known technique to use a Class D amplifier and low pass filter, as set forth in document 8 (paragraphs [0024] to [0026]) for example, therefore it would be easy for a person skilled in the art to constitute a signal amplifying means to use a Class D amplifier and a low pass filter.

Moreover, a cooling system having a heat sink, a radiator and a piezoelectric pump is known, as set forth in document 4.

The invention set forth in claim 10 does not involve an inventive step in the light of documents 1 to 4 cited in the international search report and newly cited document 8.

In the light of document 1 (description, page 6, lines 6 to 10), the piezoelectric pump driving circuit set forth in document 1 is understood to have a sine wave

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transmitting means (8) and amplifying means (10, 11).

Although document 1 does not indicate that these amplifying means (10, 11) are driven by a high voltage generated by the voltage boosting means, in driving an amplifying means it is a known technique to drive a circuit with a high voltage generated by a voltage-boosting means which converts a low-voltage power supply into a high voltage, as set forth in document 2 (page 2, lower left column, line 7 to upper right column, line 1).

In addition, in amplifying a signal which drives a piezoelectric element, it is a known technique to use a Class D amplifier and low pass filter, as set forth in document 8 (paragraphs [0024] to [0026]) for example, therefore it would be easy for a person skilled in the art to constitute a signal amplifying means to use a Class D amplifier and a low pass filter.

In addition, discharging foam by controlling fluctuations in frequency is a known technique, as set forth in document 3 (paragraph [0031], for example), and the problem that foam exists at startup is a widely known technical matter in the technical field relating to liquid pumps, therefore it would be easy for a person skilled in the art to constitute an invention so as to vary the frequency when starting up a pump.

Moreover, a cooling system having a heat sink, a radiator and a piezoelectric pump is known, as set forth in document 4.

The invention set forth in claim 11 does not involve an inventive step in the light of documents 1, 2 and 4 cited in the international search report.

In the light of document 1 (description, page 6,

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lines 6 to 10), the piezoelectric pump driving circuit set forth in document 1 is understood to have a sine wave transmitting means (8) and amplifying means (10, 11).

Although document 1 does not indicate that these amplifying means (10, 11) are driven by a high voltage generated by the voltage boosting means, in driving an amplifying means it is a known technique to drive a circuit with a high voltage generated by a voltage-boosting means which converts a low-voltage power supply into a high voltage, as set forth in document 2 (page 2, lower left column, line 7 to upper right column, line 1).

In addition, document 4 (paragraph [0031]) indicates that the driving voltage which drives a piezoelectric transducer is varied according to the temperature detected by a temperature sensor (26), therefore it would be easy for a person skilled in the art to provide a controlling means which adjusts the signal amplitude of a sine wave transmitting means according to the temperature detected by a temperature detecting means.

Moreover, a cooling system having a heat sink, a radiator and a piezoelectric pump is known, as set forth in document 4.

The invention set forth in claim 12 does not involve an inventive step in the light of documents 1, 2 and 4 cited in the international search report and newly cited document 8.

In the light of document 1 (description, page 6, lines 6 to 10), the piezoelectric pump driving circuit set forth in document 1 is understood to have a sine wave transmitting means (8) and amplifying means (10, 11).

Although document 1 does not indicate that these

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amplifying means (10, 11) are driven by a high voltage generated by the voltage boosting means, in driving an amplifying means it is a known technique to drive a circuit with a high voltage generated by a voltage-boosting means which converts a low-voltage power supply into a high voltage, as set forth in document 2 (page 2, lower left column, line 7 to upper right column, line 1).

In addition, in amplifying a signal which drives a piezoelectric element, it is a known technique to use a Class D amplifier and low pass filter, as set forth in document 8 (paragraphs [0024] to [0026]) for example, therefore it would be easy for a person skilled in the art to constitute a signal amplifying means to use a Class D amplifier and a low pass filter.

In addition, document 4 (paragraph [0031]) indicates that the driving voltage which drives a piezoelectric transducer is varied according to the temperature detected by a temperature sensor (26), therefore it would be easy for a person skilled in the art to provide a controlling means which adjusts the signal amplitude of a sine wave transmitting means according to the temperature detected by a temperature detecting means.

Moreover, a cooling system having a heat sink, a radiator and a piezoelectric pump is known, as set forth in document 4.

The invention set forth in claim 13 does not involve an inventive step in the light of documents 1 to 4 cited in the international search report.

In the light of document 1 (description, page 6, lines 6 to 10), the piezoelectric pump driving circuit set forth in document 1 is understood to have a sine wave

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transmitting means (8) and amplifying means (10, 11).

Although document 1 does not indicate that these amplifying means (10, 11) are driven by a high voltage generated by the voltage boosting means, in driving an amplifying means it is a known technique to drive a circuit with a high voltage generated by a voltage-boosting means which converts a low-voltage power supply into a high voltage, as set forth in document 2 (page 2, lower left column, line 7 to upper right column, line 1).

In addition, discharging foam by controlling fluctuations in frequency is a known technique, as set forth in document 3 (paragraph [0031], for example), and the problem that foam exists at startup is a widely known technical matter in the technical field relating to liquid pumps, therefore it would be easy for a person skilled in the art to constitute an invention so as to vary the frequency when starting up a pump.

In addition, document 4 (paragraph [0031]) indicates that the driving voltage which drives a piezoelectric transducer is varied according to the temperature detected by a temperature sensor (26), therefore it would be easy for a person skilled in the art to provide a controlling means which adjusts the signal amplitude of a sine wave transmitting means according to the temperature detected by a temperature detecting means.

Moreover, a cooling system having a heat sink, a radiator and a piezoelectric pump is known, as set forth in document 4.

The invention set forth in claim 14 does not involve an inventive step in the light of documents 1 to 4 cited in the international search report and newly cited

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document 8.

In the light of document 1 (description, page 6, lines 6 to 10), the piezoelectric pump driving circuit set forth in document 1 is understood to have a sine wave transmitting means (8) and amplifying means (10, 11).

Although document 1 does not indicate that these amplifying means (10, 11) are driven by a high voltage generated by the voltage boosting means, in driving an amplifying means it is a known technique to drive a circuit with a high voltage generated by a voltage-boosting means which converts a low-voltage power supply into a high voltage, as set forth in document 2 (page 2, lower left column, line 7 to upper right column, line 1).

In addition, in amplifying a signal which drives a piezoelectric element, it is a known technique to use a Class D amplifier and low pass filter, as set forth in document 8 (paragraphs [0024] to [0026]) for example, therefore it would be easy for a person skilled in the art to constitute a signal amplifying means to use a Class D amplifier and a low pass filter.

In addition, discharging foam by controlling fluctuations in frequency is a known technique, as set forth in document 3 (paragraph [0031], for example), and the problem that foam exists at startup is a widely known technical matter in the technical field relating to liquid pumps, therefore it would be easy for a person skilled in the art to constitute an invention so as to vary the frequency when starting up a pump.

In addition, document 4 (paragraph [0031]) indicates that the driving voltage which drives a piezoelectric transducer is varied according to the temperature detected by a temperature sensor (26), therefore it would

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Box No. V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement

be easy for a person skilled in the art to provide a controlling means which adjusts the signal amplitude of a sine wave transmitting means according to the temperature detected by a temperature detecting means.

Moreover, a cooling system having a heat sink, a radiator and a piezoelectric pump is known, as set forth in document 4.

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Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

- (1) The "fig. 6" set forth in paragraph [0042] is understood to be a typographical error for "fig. 5".
- (2) The "fig. 1" set forth in paragraphs [0049] and [0050] is understood to be a typographical error for "fig. 7".